

IN THE CLAIMS

This listing of claims replaces all prior listings:

1. (previously presented) A solid-state image pickup device including pixels each of which comprises a photodiode, a detection portion and a transfer transistor for transferring electrons accumulated in the photodiode to the detection portion, wherein the gate voltage of said transfer transistor when the electrons are accumulated in said photodiode is set to a negative voltage.

2. (original) The solid-state image pickup device as claimed in claim 1, wherein the negative voltage is set to a voltage under which a channel portion below the gate of said transfer transistor is inverted.

3. (original) The solid-state image pickup device as claimed in claim 1, wherein the negative voltage is set to -0.5V or less.

4. (previously presented) A solid-state image pickup device including pixels each of which comprises a photodiode, a detection portion and a transfer transistor for transferring holes accumulated in the photodiode to the detection portion, wherein the gate voltage of said transfer transistor when the holes are accumulated in said photodiode is set to a positive voltage,

wherein holes overflowing from said photodiode are discharged to both the substrate side and the detection portion side through a lower side of a channel portion of said transfer transistor.

5. (original) The solid-state image pickup device as claimed in claim 4, wherein the positive voltage is set to a voltage under which a channel portion below the gate of said transfer transistor is inverted.

6. (original) The solid-state image pickup device as claimed in claim 4, wherein the positive voltage is set to a power source voltage or more.

7. (original) The solid-state image pickup device as claimed in any one of claims 1 and 4, wherein an area extending from the portion just below said photodiode to a semiconductor substrate in each pixel is formed of an n-type semiconductor region having an impurity concentration lower than that of a semiconductor well region or a p-type semiconductor region.

8. (original) The solid-state image pickup device as claimed in any one of claims 1 and 4, wherein the area between said photodiode and said detection portion in each pixel is formed of an n-type semiconductor region having an impurity concentration lower than that of a semiconductor well region or a p-type semiconductor region.

9. (original) The solid-state image pickup device as claimed in any one of claims 1 and 4, wherein an area extending from the portion just below said photodiode and the area between said photodiode and said detection portion to a semiconductor substrate in each pixel is formed of an n-type semiconductor region having an impurity concentration lower than that of a semiconductor well region or a p-type semiconductor region.

10. (previously presented) A solid-state image pickup device including pixels each of which comprises a photodiode, a detection portion and a transfer transistor for transferring charges accumulated in said photodiode to said detection portion, wherein an overflow path for discharging charges overflowing from said photodiode is formed in a bulk out of a channel portion of said transfer transistor and discharges the charges in a depth direction of a substrate.

11. (original) The solid-state image pickup device as claimed in claim 10, wherein said overflow path is formed of an area extending from the portion just below said photodiode to a semiconductor substrate, and said area is formed of an n-type semiconductor region having an

impurity concentration lower than that of a semiconductor well region or a p-type semiconductor region.

12. (original) The solid-state image pickup device as claimed in claim 10, wherein said overflow path is formed in the area between said photodiode and said detection portion, and said area is formed of an n-type semiconductor region having an impurity concentration lower than that of a semiconductor well region or a p-type semiconductor region.

13. (original) The solid-state image pickup device as claimed in claim 10, wherein said overflow path is formed in an area extending from the portion just below said photodiode and the area between said photodiode and said detection portion to a semiconductor substrate, and said area is formed of an n-type semiconductor region having an impurity concentration lower than that of a semiconductor well region or a p-type semiconductor region.

14. (previously presented) A method of driving a solid-state image pickup device including pixels each of which comprises a photodiode, a detection portion and a transfer transistor for transferring electrons accumulated in the photodiode to the detection portion, wherein the gate voltage of said transfer transistor when the electrons are accumulated in said photodiode is set to a negative voltage.

15. (original) The solid-state image pickup device driving method as claimed in claim 14, wherein the negative voltage is set to a voltage under which a channel portion below the gate of said transfer transistor is inverted.

16. (original) The solid-state image pickup device driving method as claimed in claim 14, wherein the negative voltage is set to -0.5V or less.

17. (previously presented) The solid-state image pickup device driving method as claimed in claim 14, wherein the electrons overflowing from said photodiode are discharged to the substrate side.

18. (previously presented) The solid-state image pickup device driving method as claimed in claim 14, wherein the electrons overflowing from said photodiode are discharged to the detection portion side through the lower side of the channel portion of said transfer transistor.

19. (previously presented) The solid-state image pickup device driving method as claimed in claim 14, wherein the electrons overflowing from said photodiode are discharged to both the substrate side and the detection portion side through the lower side of the channel portion of said transfer transistor.

20. (previously presented) A method of driving a solid-state image pickup device including pixels each of which comprises a photodiode, a detection portion and a transfer transistor for transferring holes accumulated in the photodiode to the detection portion, wherein the gate voltage of said transfer transistor when the holes are accumulated in said photodiode is set to a positive voltage,

wherein holes overflowing from said photodiode are discharged to both the substrate side and the detection portion side through a lower side of a channel portion of said transfer transistor.

21. (original) The solid-state image pickup device driving method as claimed in claim 20, wherein the positive voltage is set to a voltage under which a channel portion below the gate of said transfer transistor is inverted.

22. (original) The solid-state image pickup device driving method as claimed in claim 20, wherein the positive voltage is set to a power source voltage or more.

23. (previously presented) The solid-state image pickup device driving method as claimed in claim 20, wherein the holes overflowing from said photodiode are discharged to the substrate side.

24. (previously presented) The solid-state image pickup device driving method as claimed in claim 20, wherein the holes overflowing from said photodiode are discharged to the detection portion side through the lower side of the channel portion of said transfer transistor.

25. (canceled).